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Test 622: McCormick Farmall 350 LPG

Tractor Test & Power Museum

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The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: May 22, 1957 to May 29, 1957
Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 622

MCCORMICK FARMALL 350 LPG

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury			
		Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling medium	Air wet bulb	Air dry bulb				
TEST B—100% MAXIMUM LOAD—TWO HOURS											
41.53	1750	4.444	9.35	0.455	164	49	58	29.023			
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR											
39.34	1750	4.099	9.60	0.443	165	52	63	29.052			
TEST D—RATED LOAD—ONE HOUR											
36.36	1750	3.878	9.38	0.453	168	55	68	29.058			
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)											
36.37	1749	3.854	9.44	0.450	169	56	70	.....		
1.09	1904	1.504	0.72	5.862	151	54	69	.....		
18.89	1813	2.767	6.83	0.623	160	53	69	.....		
37.07	1648	3.812	9.72	0.437	169	54	69	.....		
9.77	1871	2.160	4.52	0.940	158	55	71	.....		
28.39	1820	3.452	8.22	0.517	163	55	70	.....		
21.93	1801	2.925	7.50	0.567	162	54	70	29.048			
TEST L—OPERATING MAXIMUM TORQUE											
% of rated rpm (engine)		100	95	90	85	80	75	70	65	60	55
% of rated-speed torque		100	100	100	99	97	96	94	94	93	92

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
					Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling med	Air wet bulb	Air dry bulb	
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
30.07	2164	5.21	1750	3.11	3.612	8.33	0.511	162	65	77	28.933
TEST F—100% MAXIMUM LOAD											
38.30	2781	5.16	1752	4.12	3rd gear	.....	.....	157	56	74	29.015
TEST G—OPERATING MAXIMUM LOAD											
34.07	5450	2.34	1752	10.08	1st gear	.....	.....	155	59	65	28.960
35.82	3558	3.78	1751	5.43	2nd gear	.....	.....	167	57	78	28.985
36.15	2617	5.18	1753	3.84	3rd gear	.....	.....	159	56	76	29.000
35.97	2014	6.70	1750	2.85	4th gear	.....	.....	161	56	76	29.000
33.25	745	16.74	1750	0.35	5th gear	.....	.....	162	66	83	28.885
25.56	6395	1.50	1749	14.68	1st gear	TA (prt-thrtl)	.....	150	59	65	28.960
33.50	5159	2.44	1750	9.65	2nd gear	torc-ampli	.....	167	57	78	28.980
34.58	3792	3.42	1753	5.90	3rd gear	torc-ampli	.....	165	57	78	28.985
35.31	2981	4.44	1749	4.26	4th gear	torc-ampli	.....	163	56	76	29.000
34.45	1154	11.20	1751	1.17	5th gear	torc-ampli	.....	165	66	83	28.885
TEST J—OPERATING MAXIMUM LOAD											
34.18	2568	4.99	1750	7.29	3rd gear	.....	.....	165	68	78	28.915
TEST K—OPERATING MAXIMUM LOAD											
34.46	2805	4.61	1749	7.66	3rd gear	.....	.....	162	66	75	28.915

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	788 lb each	None	None
Added cast iron	560 lb each	None	None
Rear tires			
No. and size	Two 13.6-38	Two 13.6-38	Two 10-38
Ply	6	6	4
Air pressure	20 lb	14 lb	14 lb
Front wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	None	None	None
Added cast iron	None	None	None
Front tires			
No. and size	Two 6.00-16	Two 6.00-16	Two 6.00-16
Ply	4	4	4
Air pressure	20 lb	20 lb	20 lb
Height of drawbar	18½ inches	19 inches	16 inches
Static weight			
Rear end	6565 lb	3870 lb	3714 lb
Front end	1435 lb	1430 lb	1430 lb
Total weight as tested with operator	8175 lb	5475 lb	5319 lb

FUEL, OIL, WATER AND TIME Fuel Commercial Propane Weight per gallon 4.25 lb Oil SAE 20-20W To motor 1.226 gal Drained from motor 1.026 gal Water used 0.297 gal Total time motor was operated 44½ hours.

CHASSIS Type Tricycle Serial No. 565 CS Tread width rear 48" to 93" front 8½" to 16¼" Wheel base 92¼" Hydraulic control system direct engine drive Advertised speeds mph first 2.5 second 3.8 third 5.2 fourth 6.6 fifth 16.1 reverse 3.1 (Using torque amplifier) first 1.7 second 2.6 third 3.5 fourth 4.5 fifth 10.9 reverse 2.1 Belt pulley diam. 9¾" face 7½" rpm 1081 Belt speed 2759 fpm Belt flat Length 72' Width 7" Thickness 0.216" Maximum slip 0.86% Clutch single plate dry disc operated by foot pedal Seat upholstered seat on conical spring with shock absorber Brakes double disc brakes operated by two foot pedals Equalized by locking pedals together Power take-off direct engine drive with independent clutch Steering hydraulically aided.

ENGINE Make International LPG Type 4 cylinder vertical Serial No. C 175 753C Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 3⅝" x 4¼" Rated rpm 1750 Compression ratio 9.0 to 1 Displacement 175 cu. in. Valves port diameter Inlet 1 23/64" Exhaust 1 7/32" Governor variable speed centrifugal Carburetor size 1¼" Ignition system battery Starting system 12 volt battery Air cleaner oil washed wire screen Muffler was used Oil filter replaceable treated paper element Cooling medium temperature control thermostat.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J, K and L were made with an operating setting of the carburetor (selected by the manufacturer) of 95.1% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F. and 29.92" Hg)	40.02	42.73
2. Observed maximum horsepower (tests F and B)	38.30	41.53
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	30.02	36.32

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 622.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT (Chairman)
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor
Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load, $\frac{1}{2}$ rated load, maximum load at wide open throttle valve, $\frac{1}{4}$ and $\frac{3}{4}$ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

TEST L: This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instru-

ment in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and highest wheels offered by the manufacturer are used.

